CENTER FOR OPERATIONAL OCEANOGRAPHIC PRODUCTS AND SERVICES (CO-OPS)

HTTPS://TIDESANDCURRENTS.NOAA.GOV/

NOAA'S NATIONAL OCEAN SERVICE

CO-OPS

MISSION:

CO-OPS is the authoritative source for accurate, reliable, and timely water-level and tidal current measurements. Mission areas:

Enhancing Navigation   Supporting Coastal Zone Management
Assisting Coastal Hazard Mitigation   Monitoring Climate Change
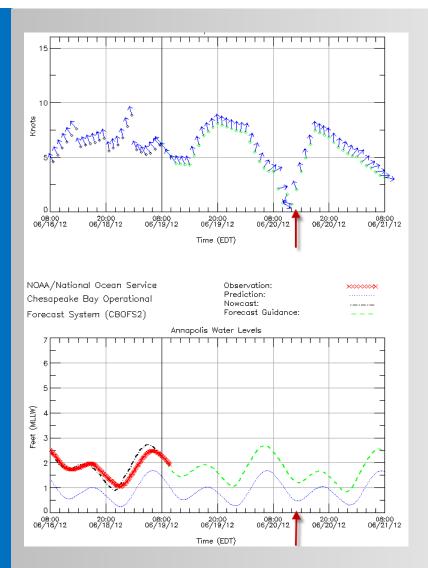
PRECISION NAVIGATION CONNECTIONS

- CO-OPS' primary mandate since 1807 is to support maritime navigation.
- CO-OPS provides real-time water levels, currents and oceanographic and meteorological observations and products for the marine navigation community
- CO-OPS' employs a cascade of products from tidal predictions, model forecasts to observations to help ensure safe navigation.
- CO-OPS observational networks are designed and installed to be highly accurate, redundant and robust.
- CO-OPS and OCS employ community modelling standards for Operational Forecast Systems and runs them on NWS' operational supercomputer
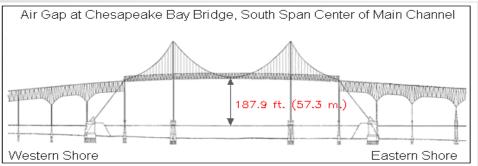
EXAMPLE:

Navigation Planning

Chesapeake Bay Bridge:
South Center of Main Channel

DATA PROVIDED

Data at Thousands of Locations

Real-time and Historic Data Along US Coasts and Great Lakes

Water Levels (6min)	> 300 Stations
Water Levels (1 min)	> 200 Stations
Currents (Water Velocity)	> 60 Stations
Meteorological	> 300 Stations
Other	Air Gap 17 stations Conductivity 24 stations Visibility 14 stations

Operational Forecasts (OFS)
Hydrodynamic Models with Operational Nowcast and Forecast Guidance

Number of OFS Regions	14 (and growing)
Parameters	water levels, water temperature, salinity, currents

Tide and Tidal Current Predictions
(Updated Quarterly)

Tide Predictions	3,200 Stations
Current Predictions	4,000 Stations/Depths

Specialized Products

Physical Oceanograhic Real Time System https://tidesandcurrents.noaa.gov/ports_info.html	Partnership program that provides integrated system of sensors for seaports that provide commercial vessel operators with accurate and reliable real-time information
CO-OPS Map https://tidesandcurrents.noaa.gov/map/	Map-based mobile friendly interface to access real-time conditions and predictions.

DATA PROVIDED

Data Services / APIs:
https://tidesandcurrents.noaa.gov/web_services_info.html

Metadata API (MDAPI)	Station locations, sensors at a station, and other associated metadata.	JSON, XML
Data API	Data retrieval for observations and predictions	CSV, JSON, XML
Derived Product API (DPAPI)	Retrieval of derived products such as sea level trends, extreme water levels, etc.	JSON, XML
ERDDAP	Data retrieval for observations.	NetCDF among others

GIS Services
Stations and products via REST GIS services

OFS Model Data
THREDDS: access to OFS data in ASCII and binary formats, including NetCDF

→ Enhance services as needed to support OCS and Precision Navigation Efforts

DRIVERS OF CHANGE AND VISION FOR THE FUTURE

- CO-OPS is continuing to move to a full Service Oriented Architecture (SOA)

- Enhancements to data services/ APIs as needed to support mission needs.

- Hope to use OCS and community libraries to assist with S-100 conversion

- Migration of full data center to the cloud (AWS) to take advantage of cloud capabilities

- Increase partnerships with oceanographic data providers to increase the availability of high quality observations

- Continue build out of operational forecast models to all U.S. tidal and coastal waters

NOAA DATA PROVIDER
OFFICE OF COAST SURVEY

DR. NEIL WESTON, TECHNICAL DIRECTOR

Organization

- Office of Coast Survey, NOAA
- Organization Mission
  - Nautical Chart Production
  - Hydrographic Surveying
  - Coastal Modeling and Research
  - IHO Standards and Specifications
  - Precision Navigation
  - Products and Services for Marine Navigation

Precision Navigation Connections

- The Office of Coast Survey is heavily involved in defining and implementing IHO standards and specifications which are critical for defining a precision navigation infrastructure and building S-100 compliant datasets for marine navigation
- S-100 Framework
- S-102 (bathymetry)
- S-104 (water levels)
- S-111 (surface currents)

Data Provided

- Nautical Charts (ENC), Surface Currents, Water Levels, Bathymetry, OFS Models

- What type of data will be made available to support Precision Navigation?
  - Surface Currents, Water Levels

- What data formats will be used?
  - Surface currents – HDF5
  - Water levels – HDF5 (soon)
  - OFS models - netCDF

Drivers of Change and Vision for the Future

- What changes do you foresee for your organization in the future with respect to new data products? What drives those changes?
  - Adoption and extensive use of IHO standards and specifications
  - Most OCS products will be based on IHO recommended standards and specifications

- What other developments should this workshop group be aware of and consider moving forward?
  - HDF5 data - reading and writing
  - S-100 framework

NOAA DATA PROVIDER
INTEGRATED OCEAN OBSERVING SYSTEM

BEN LACOUR, LCDR, NOAA, EXECUTIVE OFFICER

IOOS | Integrated Ocean Observing System

Mission: To produce, integrate, and communicate high quality ocean, coastal and Great Lakes information that meets the safety, economic, and stewardship needs of the Nation.

U.S. IOOS is a cooperative, coordinated network of federal and non-federal observing networks.

Precision Navigation Connections

Mission Area #2: Safe and Efficient Transportation and Commerce

This is primarily carried out through our 11 Regional Associations.

- Understand and meet local stakeholder needs

- Provided needed observations for marine transportation

- Develop needed coastal and inshore models

IOOS | EYES ON THE OCEAN™

Data Provided

- Wave Height
- Water Level
- Coastal Met Stations
- Surface Currents

Shore Stations

HF Radar

Coastal Moorings

Wave Buoys

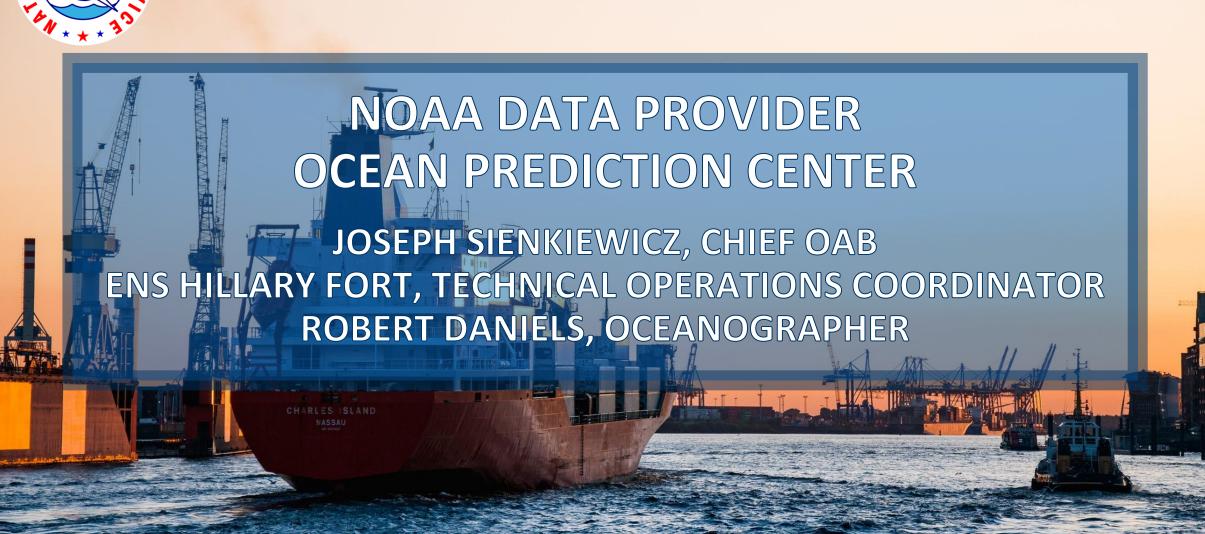# Drivers for Change and Vision for the Future

Drivers:

- Seven Societal Drivers
- Partner & Stakeholder Needs
  - Ocean Enterprise
  - User driven products and tools
- Emerging Technologies

Vision:

"Integrated, reliable, high-quality observing networks in high-traffic areas to enable greater precision in navigating busy waterways. These networks will leverage innovation to be efficient and sustainable."

IOOS | EYES ON THE OCEAN™

NOAA DATA PROVIDER
OCEAN PREDICTION CENTER

JOSEPH SIENKIEWICZ, CHIEF OAB
ENS HILLARY FORT, TECHNICAL OPERATIONS COORDINATOR
ROBERT DANIELS, OCEANOGRAPHER

National Weather Service

- Ocean Prediction Center, NOAA
- Organization Mission
  - Marine Weather Forecasts
  - Preventing loss of life and property at sea.
  - Continually monitor and analyze maritime data
  - Provide guidance of marine atmospheric variables for purposes of SOLAS as well as economic enhancement opportunities.

Precision Navigation Connections

- The Ocean Prediction Center offers products that fulfill U.S. responsibilities with the World Meteorological Organization and SOLAS. The development S-41X will comply with IHO standards and S-100 framework. S-41X is divided into three product specifications that are crucial for precision navigation.
  - S-41X
    - S-412 Marine Weather Hazards
    - S-413 Marine Weather Conditions
    - S-414 Marine Weather Observations

Data Provided

- Hazards
  - high seas hazard text forecast
- Conditions
  - forecast charts/ forecast grids
- Observations
  - Ship & Buoy Observations

What type of data will be made available to support Precision Navigation?
  - Warning Polygons, Data Format TDB, Shape File.
- What data formats will be used?
  - S-412: Polygons, GML
  - S-413: HDF5 and GML
  - S-414: TBD , GML and or HDF5

Drivers of Change and Vision for the Future

- What changes do you foresee for your organization in the future with respect to new data products? What drives those changes?
  - Evolution of the way weather information is conveyed.
  - Modernizing the delivery and content of present day services/legacy. (antiquated text bulletins)
- What other developments should this workshop group be aware of and consider moving forward?
  - Modernization of GMDSS
  - NAVTEX Bulletins
  - AIS Observations